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RIVER AND CREEK COAL IN EASTERN PENNSYLVANIA

By

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INTRODUCTION.

In the early days of anthracite coal mining little attention was paid at the washeries to the finer sizes of coal. What are now known as buckwheat coal and rice coal, and a large percentage of the pea coal found their way to the streams draining the territory either directly from the mines or by way of the culm banks. As time went on, the culm banks assumed mountainous proportions at all the large anthracite mines. In later years, with improved methods of mining and increased demands for the small sizes of coal, this waste from the mine washeries has practically stopped, and now the operators are utilizing everything except possibly the dust particles.

The coal washing into the streams from the mines and culm banks was carried away by repeated freshets and high water periods, and eventually reached the rivers. At some points on the smaller streams where there were low-lying lands adjacent to the stream banks, large quantities of coal were deposited outside the stream channels.

EARLY OPERATIONS.

For a long time no attempts were made to reclaim any of the coal washed into the streams. The first operations of which we have any record were on the Susquehanna River, first in the vicinity of Harrisburg and a little later near Sunbury, and were carried on by sand pumpers in connection with their sand business. These operations started about 1891 or 1892. For a number of years the trade

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was carried on in a desultory fashion. There was little demand for the product and a very small price could be obtained because bituminous coal was cheap and commercial plants were then not equipped with grates and blowers such as are necessary for burning fine sizes of coal.

The first river coal reclaimed in the Harrisburg district sold for about 50 cents a ton and the price did not go above 65 cents for ten years.

OPERATIONS IN THE SUSQUEHANNA RIVER AREA.

Several tributaries of Susquehanna River, viz: Swatara Creek, Wiconisco Creek, Mahanoy Creek, Shamokin Creek and the North Branch drain the anthracite coal fields. All of these tributaries with the possible exception of Swatara Creek, join in feeding coal into the Susquehanna River south of Sunbury. The beds of most of these creeks are more heavily overlaid with coal than any part of the river bed. However, for a long time operations were confined to the river, and none was started in the creeks until about 1915-16, when owing to war and labor conditions, the price of soft coal advanced and shortages in production began to be experienced.

Since 1916 numerous operations have been installed on Wiconisco, Mahanoy, and Shamokin creeks and the North Branch of the Susquehanna. The supply of coal reclaimed at some places is used for local consumption only, but the larger operators are shipping their product to eastern cities. The price of river coal has advanced to about \$2.50 a ton on board cars at point of shipping, and the industry would appear to be profitable provided its life can be sufficiently prolonged to justify the initial expense of the installation of plants.

A number of methods have been adopted in different localities along the Susquehanna and its tributaries for reclaiming the coal from the stream beds, because the different conditions of width, depth and velocity of the current seem to require different methods of working. On the river proper, including the North Branch from Pittston south to York Haven, nearly all of the coal is reclaimed by rotary pumps mounted on flat boats which are moved from place to place on the river. However, below the mouth of Mahanoy Creek south to Herndon, several operators are reclaiming large amounts of coal with bucket dredges of the endless chain type mounted on flat boats, scooping up the coal from the shoals instead of pumping it.

The creeks in most places are too narrow, shallow, or swift for the successful use of floating outfits, such as pumps and dredges, and other methods are used for reclaiming the coal. Considerable quantities in shallow water are shovelled by hand into flat boats. Rotary pumps are permanently installed on the banks, and the coal pumped either through stationary pipes placed at the weir of rude dams constructed of stones and brush, or in some instances through pipes with a flexible joint carried over a flat-boat and moved back and forth over the limited area.

On Shamokin Creek large quantities of coal are successfully harvested with clamshell scoops of about one yard capacity.

Coal cannot be profitably removed at all points along the river or its tributaries, at least by methods now in use. South of Sunbury, river operations have been successful only in certain areas. Considerable coal is being removed above the dam in the vicinity of York Haven and as far up the river as Cly, along the eastern bank opposite Highspire and Steelton, and opposite the city of Harrisburg and south of the Rockville bridge. Above the Rockville bridge the next available area is above the Clarks Ferry dam for a distance of several miles. The next area is along the east side of the river for five or six miles south of Mahanoy Creek in the vicinity of Herndon. A limited quantity of coal can be reclaimed south of Sunbury below the junction of the North and West Branches and below the mouth of Shamokin Creek. The West Branch of the Susquehanna, above its junction with the North Branch at Sunbury, does not drain any coal fields.

Between the several areas named the river is rocky and shallow and the current is too swift to permit pumping coal by portable machinery. On the creeks the water conditions are about the same at all points and the coal could be reclaimed almost anywhere. Here however, the question of transportation arises. When the coal can be recovered by portable machinery and carried on flatboats to any convenient wharf, transportation difficulties can be largely overcome, but when the coal must be deposited at a definite place on the bank where the machinery for reclaiming is located, it cannot be profitably hauled any great distance for loading on cars, and is available only for local consumption.

On Wiconisco Creek the Pennsylvania Railroad is accessible for shipping at Millersburg near the mouth of the creek, and at Woodside, at Elizabethville, and Loyaltown, $3\frac{1}{2}$, 9, and 12 miles above Millersburg. Other points along the creek are inaccessible to the railroad, and even at the places named the transportation problem is somewhat serious as the railroad grade is approximately fifty feet above the creek.

On Mahanoy Creek coal can be shipped by either the Reading or Pennsylvania railroads at Herndon at the mouth of the creek; on the Reading at Dornsife Station and at Hunter Station, seven and ten miles up the stream respectively. These are the only points on the Mahanoy Creek where large operations can be successfully conducted.

On Shamokin Creek conditions are somewhat different. The stream flows through open country between Shamokin and Sunbury and is flanked for the entire distance by both the Pennsylvania and Reading railroads. Short side-tracks from one or the other at easy grades are available and shipping facilities are all that could be desired.

Up the North Branch of the Susquehanna River the Delaware, Lackawanna and Western railroad on the west and the Pennsylvania Railroad on the east, might furnish good shipping facilities at many

points between Sunbury and Pittston. In this district however, there is little evidence that any coal has been shipped by rail, most of it having been carried to local markets on flatboats.

South of Rockville bridge on the Susquehanna River a dozen large operations and a number of smaller ones during the year 1919 reclaimed approximately 400,000 tons of coal. Much of this coal was taken out by local industries for their own use, and practically none was shipped. Among the operators in the district are Ray Stewart; Harrisburg Light, Heat and Power Company, McCreath and Shutter, Cohen and Leiby, D. W. Cox Company, M. R. Stewart, Industrial Coal Company, Central Iron and Steel Company, Frank Downey, Martin Construction and Supply Company, Sherman Hull, William Huff.

In the Clarks Ferry district the operations during 1919 were not extensive. The output for the year of the three operators - Heck Brothers, Harry Lukens and Harry Lukens, Jr., - was 30,000 tons, the greater part of which was delivered to the Harrisburg district and the remainder shipped to more distant points.

On Wiconisco Creek the largest operation has been conducted by the Juniata Public Service Company for their own use, and half a dozen other operators; including Charles Keefer, Mattes Milling Company, James Curren, and Zeigler and Swope have taken out coal which was used by local industries between Elizabethville and Millersburg. The total production for this creek for 1919 would not exceed 50,000 tons.

On Mahanoy Creek and in Susquehanna River immediately below the mouth of the creek, some large operations have been conducted and several other plants were being installed for operation in 1920. Two operators have removed about 50,000 tons from the river in 1919, and six comparatively large plants on the creek and four or five smaller ones have taken out 100,000 tons. Among the operators in this district are Beck and Hillbush, Herndon Coal Company; Eastern Coal Estate, Hower Coal Company, High Carbon Fuel Company, C. D. Raker, Dornsife Coal Company, H. L. Beck and B. W. Findham. The greater part of the 150,000 tons reclaimed in this district in 1919 was shipped to eastern cities.

On Shamokin Creek, probably owing to better transportation facilities, the industry seems to have been overworked during the last two years. Operations along the creek are almost as numerous as fishermen along a popular trout stream on the first day of the season. Some of the plants on this creek have larger capacity than any others in the district. Four operators are loading about ten cars of coal a day; six about five cars a day, and twelve about one car a day. About six plants on the stream were not working during the latter part of 1919. The large operations in this district are conducted by the Black Diamond Reclaiming Company, Arters Coal Company, Anthracite Reclaiming Company, Eyre Coal Company, Paxinos Coal Company, A. Persing and Company, and Weston Dodds Company. Operators on Shamokin Creek during 1919 reclaimed 750,000 tons of coal; all of which was shipped to Reading, Philadelphia and New York, and to intermediate points, except a small quantity used in Sunbury.

On the North Branch of Susquehanna River operations have been conducted near Sunbury, largely by the Sunbury Converting Works for their own use. About 20,000 tons were removed during 1919 by this company. The Bloomsburg Heating Company, Schneidman Brothers, Hoffman Brothers, Luther Hess, C. B. Robbins, and C. E. Custer reclaimed about 30,000 tons between Sunbury and Shickshinny.

North of Shickshinny and as far up the river as West Pittston a number of operators have been removing coal in a small way. Local public service companies have been dredging or pumping coal for their own use, and at least a dozen operators of flats working rather spasmodically, as the price or demand for coal happens to increase, have taken out a considerable tonnage. Altogether there was taken out north of Shickshinny approximately 150,000 tons, the principal operators being the Scranton Electric Company, Utilities Supply Company, Thomas Coal Company, Burns and Flannigan, Davis and Daulbert, and John S. Solsoki.

The total output of coal from the Susquehanna River and its tributaries during the year 1919 was approximately 1,580,000 tons.

In studying the industry along Susquehanna River and its tributaries, one apparently available district was found which, up to the present time, has not been worked, namely, Swatara Creek northeast of Jonestown. Swatara Creek rises in the vicinity of Good Spring and Donaldson, east and north of Tremont, and drains a number of mining areas between Good Spring and Pine Grove, fifteen miles to the south. The stream from its source to Jonestown, a distance of twenty miles or more, has a rapid fall and at many places on its banks and bed, shows conditions similar to those in Wiconisco, Mahanoy and Shamokin creeks. The stream has been laden with coal wash of the same character as the other streams for about eighteen years, and up to the present time comparatively none has been reclaimed. At several places on the banks in the vicinity of Sudesburg and Inwood, little piles of coal were found which evidently had been dug by hand.

Below Jonestown Swatara Creek becomes winding and comparatively sluggish, and before it reaches the river at Middletown has apparently lost its coal deposits. As far up the stream as Hummelstown there is little indication of coal along the banks or on the shoals; the water is only slightly discolored, and it is said that fish have been living in this part of the stream continuously. It would seem that certainly at some places along this creek, which could be determined only by investigation, there must be either in the creek bed or along the banks large deposits of available coal. There are however, no good transportation facilities between Jonestown and Hummelstown. One hundred thousand tons of coal could be reclaimed between Jonestown and Tremont.

OPERATIONS IN THE SCHUYLKILL RIVER AREA.

In the Schuylkill River area all of the operations are along the river between Schuylkill Haven and Reading. Between these two

points the river is flanked by the Pennsylvania and Reading railroads and transportation facilities are good. Practically all of the coal taken from Schuylkill River is reclaimed by rotary pumps mounted on flatboats as in the Harrisburg district. Near Schuylkill Haven five operators, the Schuylkill Haven Drifted Coal Company, Spannuth and Bittle River Coal Company, Baker Coal and Ice Company, Bowen Brothers, and John B. Sirocco Company, removed 55,000 tons in 1919, the greater part of which was shipped to Reading and Philadelphia.

Near Landingville four operators, Bechtel and Nichter, Landingville Drifted Coal Company, Allenbach Coal Company and C. Arthur Fisher removed 30,000 tons, which was shipped to eastern points. Between Landingville and Auburn the Beecher Coal Company, Schappel and Bousher, Auburn Brick Works, Mengel Coal Company and the Delaware Seamless Tube Company have removed 40,000 tons, most of which was used locally. Between Auburn and Port Clinton the Black Diamond Coal Company, Sallage and Hicks, Charles Berkey and several other operators removed 45,000 tons, most of which was shipped to eastern markets.

From Port Clinton southward, partly owing to river conditions, the next operation is near Berne Station, south of Hamburg, where Alfred O. Workley reclaimed 10,000 tons in 1919. At Shoemakersville Grant E. Alleman and several other operators reclaimed 20,000 tons. At Lenhartsville the operator removed 10,000 tons, and at Reading two pumping outfits operated by John M. Ebersole reclaimed 25,000 tons, all of which was used locally.

Coal is not dug in Schuylkill River south of Reading, except intermittently in a small way. The total output from Schuylkill River in 1919 was 235,000 tons.

In connection with the character of the Schuylkill River supply, it is interesting to note that at a point one mile south of Schuylkill Haven, the Schuylkill Haven Drifted Coal Company has been operating almost continuously for four years on an area said not to exceed 4000 square feet, moving their pump up and down the stream for a distance of 200 feet between an abandoned canal dam and a railroad bridge. They have removed many thousands of tons of coal from this area and state that at no time were they compelled to suspend operations for lack of coal.

The operations on the Schuylkill River are rather small compared with some on the Susquehanna and its branches. Only a few are five years old. They have a capacity running from about 8,000 to 15,000 tons per year. The water conditions are not favorable for pumping at all points, but at the places above named there are good pumping fields and transportation facilities are favorable. There must be quantities of coal remaining in the river bed north of Reading, and there are large deposits in the bottom lands adjacent to the river banks.

OPERATIONS IN THE LEHIGH RIVER AREA.

The Lehigh River drains only a small part of the anthracite coal fields and has comparatively few river coal developments. The principal ones are operated by the Lehigh Coal and Navigation Company at two points in connection with the dredging of their canal bed. This company reclaimed in 1919 about 100,000 tons of coal. Only two other operations could be found on the river, both of them small and located in the vicinity of Mauch Chunk. These two removed 20,000 tons in 1919.

TOTAL OUTPUT OF RIVER AND CREEK COAL.

The total output of coal from Lehigh River in 1919 was 120,000 tons, from Schuylkill River 235,000 tons, and from Susquehanna River and its tributaries 1,580,000 tons. The total output of river coal in eastern Pennsylvania in 1919 therefore can be estimated at 1,935,000 tons. Approximately the same amount of coal was reclaimed in 1918, but prior to that year the output was much less.

RELATION OF WATER SHED TO COAL MEASURES.

Susquehanna River and its tributaries drain about 73 per cent of the area of the anthracite coal fields; Schuylkill River about 18 per cent and Lehigh River about 9 per cent. It does not necessarily follow that the same proportion of coal is washed into the several rivers. It is likely that a larger proportion of the coal in the Schuylkill and Lehigh rivers is lost, than there is of that reaching the Susquehanna. The Susquehanna River has a divided current from where it receives the coal wash even so far as the York Haven dam. The waters from the Juniata River and the tributaries entering from the west follow the west bank; while the waters coming from the coal regions follow the east bank. From Sunbury to Harrisburg along the east bank only a few small tributaries enter the river which are not coal bearing. The divided current provides shoaling places in mid stream where the coal is deposited, and from which a large proportion of the river coal is reclaimed. On Schuylkill and Lehigh rivers, large tributaries which are not coal bearing enter the streams from both east and west below the coal fields, greatly increasing the flow without creating a divided current as in the Susquehanna and without providing shoaling places for the coal.

FUTURE OF THE RIVER COAL INDUSTRY.

Just what the life of this industry may be and how long the supply may last is hard to determine. However, by roughly estimating the depth, length, and width of the coal deposits in the streams, there is sufficient evidence to warrant assuming that the output in certain districts may be increased and that in others the present developments may be continued for a period of at least five years, even though practically no more coal should be deposited.

This would not include any increase in production south of the Rockville bridge on the Susquehanna River. One hundred thousand tons more a year could be reclaimed in the Clarks Ferry district, on Wiconisco Creek, and the North Branch of Susquehanna River south of Nanticoke. It is likely however that the Shamokin Creek deposit worked to its present capacity would be exhausted in much less than five years. There is not now relatively the same amount of coal in the bed of Shamokin Creek that may be found in other creek or river beds. There is, however, a district along Shamokin Creek between Snyderstown and Paxinos, where approximately eight hundred acres of bottom lands adjacent to the stream are covered with a thick deposit of coal. No attempt has yet been made to reclaim this coal except in one or two places where by means of drags, small quantities have been brought within reach of clamshell buckets. If a practical way be found to reclaim this coal, the life of the industry in the Shamokin district would probably be prolonged several years and it might be brought to the five year limit of the other areas.

On Schuylkill River north of Reading the output could unquestionably be doubled. There are areas adjacent to the river which are overlaid with coal. Some of these areas are covered with bushes and small trees but others are practically clean and the coal might be reclaimed easily.

Lehigh River is yielding as much coal as can be successfully removed and no material increase is possible.

The estimate that the industry may continue for a period of five years with some increase in the present rate of production is based upon the assumption that no more coal would reach the streams. It is not likely, however, that the supply will suddenly cease. For some time no coal has been wasted from the mines and the supply has been coming from the culm banks. These culm banks are being removed and utilized and eventually will be exhausted. With the present improved system of mining, and the now recognized value of the smaller sizes of coal, when the culm banks are gone the supply into the streams will practically cease. However, while the culm banks are being used, owing to the loosening up and handling of the coal, more coal is washed into the streams than when the banks are undisturbed. Within the next few years large quantities of coal may be washed into the creeks and rivers and become available for future reclaiming. In several places where washeries established at typical culm banks have been in operation for about four years, the banks have been about half removed. There are many culm banks of about the same size as yet untouched, and if the same process be adopted for utilizing these, it would appear that at least for eight or ten years further supplies of small sizes of coal will reach the streams.

WORKING CONDITIONS.

Few localities were found during this investigation in which it appeared necessary to suspend operations at any time on account of the scarcity of coal. This condition might occur occasionally in Susquehanna River south of the Rockville bridge. However, conditions

frequently interfere with the operation of river and creek coal plants. It appeared that those plants which worked when conditions permitted were able to operate about 200 days during the year. Many of the smaller operators do not attempt to work continuously and have their equipment in service only when conditions are most favorable or when they have orders to fill. At least one-half of the operations with a capacity of 5000 to 10,000 tons per year were idle at the time the investigation was made. Others which had suspended earlier in the year were just resuming operations. It is likely that if the owners and operators of these smaller plants could be encouraged with a steady market for their product, they would work continuously, and would easily take care of the suggested increase in output.

QUALITY OF PRODUCT.

River and creek coal is more or less mixed with small pebbles, bits of wood, sand and other foreign substances which cannot successfully be screened out, and much of it looks as if it would be rather poor fuel. The purity and size of the coal depends somewhat on the location from which it is reclaimed. The cleanest coal and the largest pieces are found nearest to the mines. On Wiconisco Creek above Elizabethville where the mines are only a few miles distant, a fair percentage of the product is screened to sizes that can be burned in small heating plants without forced draft. Probably the best coal for all purposes is found in the upper part of Wiconisco Creek, but the quantity is limited and the transportation facilities are not very good. As coal is carried farther down stream it becomes smaller and more mixed with foreign matter. In the larger streams, especially where it is carried from tributaries, the coal is found mixed with sand. And again, after it is carried for some distance in the larger streams, the action of the water appears to have screened out the sand to a considerable extent. Beds are found in the Susquehanna and Schuylkill rivers containing sand and coal in all proportions. In some places the sand so predominates that it is more profitable to recover it and waste the coal. Shoals which do not contain more than 25 or 30 per cent of sand can be successfully washed, though no apparatus in use will entirely remove sand or other foreign matter. It is said that an electrical device lately invented will separate sand and coal completely, regardless of the proportion of sand or other foreign matter mixed with the coal. Although as washed by present methods, most of the river coal looks dirty, those who have been using the product with proper appliances, have been getting surprisingly good results.

Analyses of coal reclaimed by the Lehigh Coal and Navigation Company and furnished to the New Jersey Zinc Company are reported as showing 10 per cent ash. Analyses of coal taken from various points along the Susquehanna and its tributaries are said to run from 13 to 15 per cent ash.

EQUIPMENT FOR BURNING RIVER COAL.

When river coal was first put on the market, few plants were equipped with proper grates and blowers for using such small material.

However, at present the commercial plants are burning the small sizes of coal from the mines as well as from the rivers, and in most plants either product can be used. For hand stoking, stationary sectional grates, with funnel shaped apertures, very small at the top surface of the grate and widening to the under surface, are largely used. On this type of grate the ashes and cinders must be pulled. Revolving or chain grates are used with automatic stokers. Blowers for making forced draft are of the electric fan or steam turbine types.

CONCLUSION.

The life of the river coal industry as predicted in this report is based upon the presumption that there will be a continuous output in the next five to ten years at about the same rate as in 1919. Long before the supply of river coal is exhausted, however, the prices and supply of mine coal may decrease the rate of production of river coal to what it was prior to 1919, to await the stimulus of future abnormal prices or shortages of coal. In such case, the industry might be continued as a sporadic business, much longer than for the predicted ten year period.

The development of natural resources is frequently attended by economic waste. In Pennsylvania we wasted our timber resources—our mountain sides covered with rotting logs testify to our prodigality. Unfortunately, we fully realized our timber loss only after the supply was depleted. In the coal fields the waste was just as pronounced, but in this case we were more fortunate. The streams picked up and preserved the discarded coal and even carried it part way to market. Much of this waste of former years is being and will be reclaimed.

In addition to its direct economic value, river coal may have served another useful purpose, the benefits of which may continue long after the industry itself has disappeared. The advent of river coal at attractive prices has stimulated the invention and installation of equipments adapted for its use, and also for use of the smaller sizes of coal from the mines. Before the advent of river coal there was no market for the small sizes of mine coal because commercial plants could not use them. When the supply of river coal is exhausted there will be hundreds of plants equipped for burning the small sizes of coal from the mines and consequently a market for the product.

Therefore, the ultimate death of the river coal industry will not mean a loss in our resources, but rather a gain. The small sizes of mine coal will have a market, and having commercial value, will reduce the price of larger sizes.

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